



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/DK92/00111 <b>(22) International Filing Date:</b> 9 April 1992 (09.04.92) <b>(30) Priority data:</b> 0627/91 9 April 1991 (09.04.91) DK <b>(71) Applicant (for all designated States except US):</b> TULIP INTERNATIONAL A/S [DK/DK]; Havnegade 24, DK-7100 Vejle (DK). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> MAGÅRD, Tom [DK/DK]; Havnegade 24, DK-7100 Vejle (DK). <b>(74) Agent:</b> K. SKØTT-JENSEN PATENTINGENIØRER A/S; Lemmingvej 225, DK-8361 Hasselager (DK).		<b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CI (OAPI patent), CM (OAPI patent), CS, DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC (European patent), MG, ML (OAPI patent), MN, MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, RU, SD, SE, SE (European patent), SN (OAPI patent), TD (OAPI patent), TG (OAPI patent), US.  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Danish).</i>
<b>(54) Title: METHOD AND EQUIPEMENT FOR CURING HAM</b>		
<b>(57) Abstract</b>  At curing meat such as pork, beef or veal where the brine cannot be completely dissolved in the water amount accessible, the brine can be kept suspended in liquid by adding a small quantity of carrier and comminution in a colloid mill and homogenizer. In this manner the brine can in one operation be injected in the meat, and thereby it is rendered possible to achieve a continuous monitoring and accurate control of the brine percentage and increase, likewise the process time can be reduced significantly.		

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### Method and equipment for curing ham.

The present invention relates to a method for curing meat as well as equipment for applying the method.

Despite the fact of curing muscle meat using an injector offers the fastest curing time known, the curing still takes relatively long compared with the other process times involved in curing meat. The injector injects fully dissolved brine into the meat. However, the quantity of water necessary for dissolving the entire quantity of brine ingredients is not always allowed due to quality stipulations. Hence only part of the brine ingredients is injected into the meat. The remainder of the ingredients is added as a dry substance. This is performed in a massage equipment, stirring vat or similar apparatus where the dry brine ingredients are worked into the meat. Upon it being massaged the meat is left to rest for a considerable period of time for the ingredients to disperse evenly in the meat. The total process time is 32-36 hours.

The object to be achieved is simply to reduce the long process time and preferably such that the quality be improved but in no circumstances be lowered. In a surprisingly simple manner this can be achieved by suspending the total amount of brine ingredients in the quantity of water attainable and inject the thus suspended brine into the meat. By injecting the total quantity of brine into the meat at one go it proves that a substantial reduction of the long process time in the massage equipment and the subsequent rest period can be achieved. The injector disperses the brine evenly in the meat. Not only are the injector needles present quite densely, but the injection takes place all over the bulk of the meat. The ingredients are added to a container having a stirrer that holds these suspended in the

water. However, it may present a problem that the ingredients start depositing at the inlet to the injector needles causing a blocking of the injector as well as unevenly injected brine. By adding a negligible quantity of thickener, like e.g. Gelodan (brand name) it is possible to increase the suspension capacity considerably, i.e. such that the ingredients are kept floating in the liquid for a considerably longer period of time. The suspension capacity can be further increased by fragmenting the brine ingredients in a colloid mill before adding them to the liquid. An additional improvement of the suspension capacity is achieved by leading the brine through a homogenizer before inlet to the injecting needles of the injector. In the homogenizer a further comminution of the brine ingredients is performed. The ingredients consequently remain floating for longer in the liquid, and when it takes place immediately before the inlet to the injection needles the optimum conditions are achieved for the brine ingredients to remain suspended until the injection is performed. The small particle size is also advantageous seen in relation to preventing a blocking of the injection needles. Out of consideration for the flow paths in the injector needles and the texture of the meat, the maximum is 120  $\mu$ m for undissolved particles in the brine.

During brine treatment - stirring of the supply container, homogenizing - a significant increase in temperature is experienced. Thus temperatures of 25°C have been recorded, which are inadmissible due to veterinary reasons. At this temperature a crystallization commences in the injector resulting in a blocking of the needles. This is counteracted by a cooling of the brine before inlet to the injector. Preferably the cooling should be effected to below 0°C, suitably approximately -2°C which proves possible. Surprisingly enough it also turns out to have an improving effect on the desired solution of

the salt soluble proteins. This contributes to the possibility of reducing the process time.

As an example the following known brine composition for curing hams can be mentioned to illustrate the invention:-

Water  
Carnal (brand name) (phosphate product)  
Nitrite salt  
Vacuum Salt (sodium chloride)  
Dextrose (brand name) (sugar product)

Of this typically 80% of the nitrite and the vacuum salt is dissolved together with the entire quantity of Carnal in 90-100% of the water. This complete solution is injected into the meat. The remainder of the ingredients 0-10% of the water, 20% of the nitrite and vacuum salt together with the entire quantity of Dextrose is added in its dry condition at the massaging process. This addition of brine and dry brine ingredients in two operations causes a long process time as already mentioned, but impedes, too, the correcting and controlling of the brine addition.

The brine composition of the invention remains largely the same apart from the addition of a negligible quantity of carrier here being gelatine having the brand name Gelodan. As a concrete example the following composition can be quoted:-

Water	61.50 weight%	61.50
Gelodan	0.03	
Salt	26.06	
Nitrite	0.14	
Phosphate	4.58	
Dextrose	<u>7.69</u>	
Total ingredients		<u>32.50</u>
		100.00

All brine ingredients are put into the water in one go together with the Gelodan that has been dissolved in hot water in advance. The quantity of added Gelodan is so small - out of veterinary considerations preferably not above 0.03 weight per cent - that the brine still retains a very watery character, and the end product is not changed. The undissolved brine ingredients are kept suspended in the water and the brine is injected into the meat as a suspension offering a fast and even distribution of the ingredients in the meat. As it takes place in one operation it allows the possibility of a more efficient control and correction of the process.

An equipment for curing meat with a dispersed brine is schematically illustrated in the accompanying drawing. The brine ingredients are initially comminuted in a colloid mill (not shown) to a grain size of approx. one tenth of the original size, upon which the brine ingredients with water and dissolved Gelodan are put into a supply container 2 having a stirrer for keeping the particles floating in the liquid. The brine is led to a homogenizer 4 that disperses the particles in the liquid and pressure feeds the brine to the needle arrangement of an injector 6. Between the homogenizer and the injector a cooler for cooling the brine to  $-2^{\circ}\text{C}$  is inserted. It is important that the cooling takes place immediately following the homogenizer in order to check a possible crystallization. The brine that leaks outside the pieces of meat during injection is returned to the supply container. As this brine has been cooled to  $-2^{\circ}\text{C}$  it has a cooling effect on the brine in the supply container. Upon the injection the pieces of meat are led through a pair of rollers 6, "tenderizers" for further dispersing of brine from the injection points.

In order to ensure a high degree of uniformity it is vital that the brine ingredients be kept floating all the time in the liquid everywhere inside the apparatus,

i.e. the supply container, the inlet to the injector, inside the injector, in the collection unit and the return pipe to the supply container. It is important, too, to cool the brine, partly due to veterinary reasons and partly to prevent crystallizations in the injector causing a subsequent risk of blocking of the needles. When this is the case, the salt percentage and the increase can be surveilled, controlled and corrected.

The invention thus offers a fast and even distribution of suspended brine into muscle meat at the same time rendering possible a continued control and precise correction of the salt per cent and increase.

## C L A I M S:

1. A method for curing meat, such as pork, beef or veal where the brine ingredients cannot be fully dissolved in the quantity of water attainable, characterized in that the undissolved brine ingredients are kept suspended in the water and that the suspension of brine is injected into the meat.

2. A method according to claim 1, characterized in that a negligible quantity of carrier(s) is/(are) added to the water as e.g. the thickener Gelodan (brand name), preferably not exceeding 0.03 weight per cent of the produced brine.

3. A method according to claim 1, characterized in that the brine ingredients for being added to the water are comminuted in a colloid mill, e.g. to the size one tenth of that of the usual ingredients.

4. A method according to claims 1, 2 or 3, characterized in that the brine before the injection is passed through a homogenizer having a pressure between 100-1000 bar.

5. A method according to claims 1, 2, 3 or 4, characterized in that the brine prior to being injected is cooled to very few degrees at about 0°C, preferably below 0°C, advantageously approximately -2°C.

6. An equipment for applying the method according to claims 1-5, characterized in that it comprises a supply container for the brine and having a stirrer or similar equipment for keeping the brine ingredients suspended in the liquid as well as an injector for injecting the brine into the meat, the inlet of brine from the



supply container to the needle arrangement of the injector being short and direct.

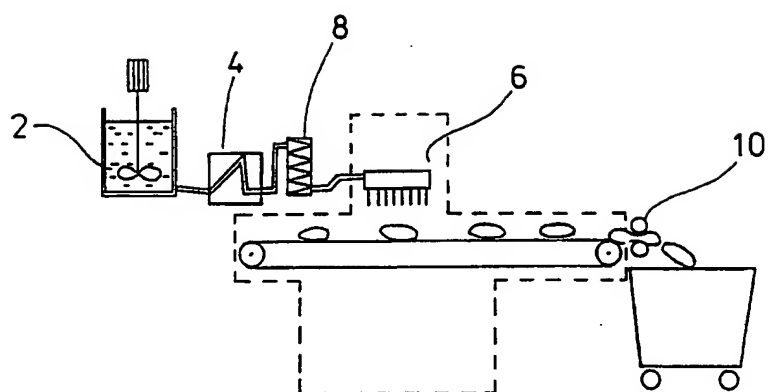
7. An equipment according to claim 6, characterized in that it comprises a colloid mill for comminuting brine ingredients prior to their inlet to the supply container.

8. An equipment according to claims 6 or 7, characterized in that the inlet from the supply container is a homogenizer for comminution of the brine and a pressure feeding of this brine to the needle arrangement of the injector.

9. An equipment according to claims 6, 7 or 8, characterized in that it comprises a cooler for cooling the brine prior to this being led to the injector.

10. An equipment according to claims 5, 6, or 7, characterized in that it comprises at least one pair of rollers between which the meat passes upon injection for dispersing the brine into the meat.

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# INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00111

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>8</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: A 23 B 4/023, 4/28, 4/32		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	A 23 B; A 22 C	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB, A, 2235616 (W.R. GRACE & CO) 13 March 1991, see page 3, line 17 - line 21 --	1-3
X	EP, A1, 0297592 (FOMACO FOOD MACHINERY COMPANY A/S) 4 January 1989, see column 5, line 35 - line 54; figure 1 --	6,9
A	WO, A1, 8500091 (MILLER, RONALD ET AL) 17 January 1985, see the whole document -- -----	1-10
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
9th July 1992	1992-07-14	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	Kerstin Boije Janson	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 92/00111**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 29/05/92. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		EP-A-B- 0151142	85-08-14
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		US-A- 4786515	88-11-22